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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to a photosensitive composition. It is related with the photosensitive resin composition of a low dielectric suitable as the material for forming in more detail the protective film etc. which are used for electronic parts, or an interlayer insulation film and the material for forming interlayer insulation films, such as a liquid crystal display element, an integrated circuit device, and a solid state image pickup device, especially.

[0002]

[Description of the Prior Art]The insulator layer for maintaining the flattening film for generally carrying out flattening of the protective film for preventing the degradation and damage, an element surface, or the wiring to electronic parts, such as a liquid crystal display element, an integrated circuit device, and a solid state image pickup device, and the light filter for liquid crystal displays and electric insulation, etc. are provided. In order to insulate between the wiring arranged in layers, the interlayer insulation film is provided in the thin film transistor (it is hereafter described as "TFT".) mold liquid crystal display element, or the integrated circuit device. However, in forming an interlayer insulation film, using the thermosetting material for the insulator layer formation for the electronic parts known conventionally. Since there is a problem that the interlayer insulation film in which the routing counter for obtaining the interlayer insulation film of the pattern shape to need has sufficient surface smoothness many moreover is not obtained, development of the photosensitive new insulating film formation material in which detailed patterning is possible has been called for. Such materials have come to be asked for a low dielectric in connection with the densification of wiring or a device in recent years.

[0003]As what can meet such a demand, ring opening polymerization of the norbornene system monomer of ester group content is carried out, After hydrogenating, the constituent containing the alkali solubility cyclic olefin polymer, cross linking agent, and radiation-sensitive acid generator which are produced by hydrolyzing an ester group portion is proposed (JP,H11-52574,A). However, even when this resin composite was used, in the development after sensitization, an unexposed portion could not fully be removed but high-density

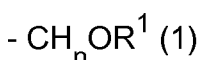
patterning was difficult.

[0004]

[Problem to be solved by the invention] There is the purpose of this invention in providing the photosensitive resin composition which can form easily the detailed pattern state thin film excellent in the low dielectric while it is excellent in many performances, such as surface smoothness, heat resistance, transparency, and chemical resistance. The alkali solubility alicyclic olefin polymer produced by this invention person making carry out the reaction of degeneration of the compound which has an acidic group to an alicyclic olefin polymer as a result of inquiring in order to attain the above-mentioned purpose, By using the constituent containing a specific cross linking agent and a photo-oxide generating agent, it finds out that the purpose of this invention can be attained and came to complete this invention based on this knowledge.

[0005]

[Means for solving problem] According to this invention, the photosensitive resin composition containing the alkali solubility alicyclic olefin polymer produced by making carry out the reaction of degeneration of the compound which has a compound or acid derivative type residue which has an acidic group to an alicyclic olefin polymer, the cross linking agent which has a basis expressed with a formula (1), and a photo-oxide generating agent is provided.



[R¹ is a hydrogen atom or an alkyl group among a formula (1). n is 1 or 2 (in addition, when n is 1, it becomes a divalent functional group.).]

[0006]

[Mode for carrying out the invention] The photosensitive composition of this invention contains an alkali solubility alicyclic olefin polymer, a cross linking agent, and a photo-oxide generating agent.

[0007] The alkali solubility alicyclic olefin polymer used suitably for this invention carries out the reaction of degeneration of the compound which has a compound or acid derivative type residue which has an acidic group to an alicyclic olefin polymer, and is obtained. An alicyclic olefin polymer is a polymer of the olefin which has alicyclic structure. although cycloalkane structure, cycloalkene structure, etc. are mentioned as alicyclic structure -- the cycloalkane structure from viewpoints of a mechanical strength, heat resistance, etc. -- norbornane structure is especially preferred. As alicyclic structure, a monocycle, many rings, condensed multi-ring, cross-linking ****, these combination many rings, etc. are mentioned. 4-30 pieces, although there is no restriction when the number of carbon atoms which constitutes alicyclic structure is exceptional, when it is 5-15 ranges more preferably, a mechanical strength, heat resistance, and the various characteristics of a moldability balance highly, and are usually preferably preferred for 5-20 pieces. The alicyclic olefin polymer used by this invention is usually a thermoplastic thing.

[0008] An alicyclic olefin polymer usually contains the repeating unit of the olefin (it may be hereafter called alicyclic olefin.) origin which has alicyclic structure. Although the rate of the repeating unit of the alicyclic olefin origin in an alicyclic olefin polymer is suitably chosen according to the purpose of use, it is 30 to 100 weight %

usually 70 to 100 weight % more preferably 50 to 100weight %. If there are too few rates of the repeating unit of alicyclic olefin origin, it is inferior to heat resistance and is not desirable. There is no exceptional limitation as repeating units other than the repeating unit of alicyclic olefin origin, and it is suitably chosen according to the purpose of use.

[0009]What has a polar group is mentioned as an alicyclic olefin polymer used by this invention. As a polar group, hydroxyl, a carboxyl group, an alkoxyl group, an epoxy group, a glycidyl group, an oxycarbonyl group, a carbonyl group, an amino group, an ester group, carboxylic anhydride groups, etc. are mentioned.

[0010]An alicyclic olefin polymer is usually obtained in an alicyclic olefin addition condensation or by [which carry out ring opening polymerization and hydrogenates an unsaturation connecting part if needed] depending especially, carrying out addition condensation of the aromatic olefin, and hydrogenating the aromatic ring portion of this polymer.

[0011]As an alicyclic olefin used in order to obtain an alicyclic olefin polymer, it is [bicyclo]. [2.2.1]- Bicyclo [hept 2-ene (a trivial name: norbornene), / 5-methyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5,5-dimethyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-ethyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-butyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-hexyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-octyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-octadecyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-ethylidene-] [2.2.1]- Bicyclo [hept 2-ene, / 5-methylidene-] [2.2.1]- Bicyclo [hept 2-ene, / 5-vinyl-] [2.2.1]- Hept 2-ene, [0012]Bicyclo [5-propenyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-methoxy-carbinyl] [2.2.1]- Bicyclo [hept 2-ene, / 5-cyano] [2.2.1]- Bicyclo [hept 2-ene, / 5-methyl-5-carbomethoxy-] [2.2.1]- Bicyclo [hept 2-ene, / 5-carboethoxy-] [2.2.1]- Bicyclo [hept 2-ene,] [2.2.1]- Bicyclo [hept 5-enyl 2-methylpropionate,] [2.2.1]- Hept 5-enyl 2-methylocta NEITO, [0013]Bicyclo[2.2.1]- Bicyclo [a hept 2-ene- 5,6-dicarboxylic anhydride, / 5-hydroxymethyl] [2.2.1]- Bicyclo [hept 2-ene, / 5,6-Jl (hydroxymethyl)-] [2.2.1]- Bicyclo [hept 2-ene, / 5-hydroxy-i-propyl] [2.2.1]- Bicyclo [hept 2-ene, / 5,6-dicarboxy-] [2.2.1]- Bicyclo [hept 2-ene,] [2.2.1]- Bicyclo [hept 2-ene- 5,6-imidodicarboxylate, / 5-cyclopentyl] [2.2.1]- Bicyclo [hept 2-ene, / 5-cyclohexyl-] [2.2.1]- Bicyclo [hept 2-ene, / 5-cyclohexenyl] [2.2.1]- Bicyclo [hept 2-ene, / 5-phenyl-] [2.2.1]- Hept 2-ene, [0014]Tricyclo[4.3.0.1^{2,5}] Deca- 3,7-diene (a trivial name: dicyclopentadiene), tricyclo [4.3.0.1^{2,5}] Dec-3-ene, tricyclo [4.4.0.1^{2,5}] Undeca- 3,7-diene, tricyclo [4.4.0.1^{2,5}] Undeca- 3,8-diene, tricyclo [4.4.0.1^{2,5}] Undec-3-ene, tetracyclo [7.4.0.1^{10,13}.0^{2,7}] - Trideca- 2,4,6-11-tetraene (an alias: 1,4-methano-1,4,4 a,9a-tetrahydro fluorene), tetracyclo [8.4.0.1^{11,14}.0^{3,8}] - Tetradeca- 3,5,7,12-11-tetraene (an alias: 1,4-methano-1,4,4a,5,10 and 10a-hexahydroanthracene), [0015]Tetracyclo[4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene (a trivial name: tetracyclo dodecen), 8-methyl-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-ethyl-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-methylidene-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-ethylidene-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-vinyl-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-propenyl-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-carbomethoxy-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-methyl-8-carbomethoxy-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-hydroxymethyl-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-carboxy-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, [0016]8-cyclopentyl tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-

3-ene, 8-cyclohexyl-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-cyclohexenyl tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, 8-phenyl-tetracyclo [4.4.0.1^{2,5}.1^{7,10}] - Dodec-3-ene, pentacyclo [6.5.1.1^{3,6}.0^{2,7}.0^{9,13}] Pentadeca- 3,10-diene, pentacyclo [7.4.0.1^{3,6}.1^{10,13}.0^{2,7}] - Pentadeca- 4,11-diene, [0017]Bicyclo [5-phenyl] [2.2.1]Hept 2-ene, tetracyclo [6.5.0.1^{2,5}.0^{8,13}] Trideca 3,8,10,12-tetraene (it is also called a 1,4-methano 1,4,4a,9a-tetrahydro fluorene), tetracyclo [6.6.0.1^{2,5}.1^{8,13}] A norbornene system monomer like tetradeca- 3,8,10,12-tetraene (it is also called the 1,4-methano 1, 4, 4a, 5, and 10 and 10a-hexahydroanthracene); [0018]Cyclobutene, cyclopentene, a cyclohexene, 3,4-dimethylcyclopentene, 3-methylcyclohexene, a 2-(2-methylbutyl)-1-cyclohexene, Cyclooctane and 3a,5,6,7a-tetrahydro 4,7-methano-1H-indene, cycloalkene [of the monocycle like cyclohepten]; -- vinyl system alicyclic hydrocarbon system monomer; like a vinylcyclohexene or vinylcyclohexane -- alicyclic conjugated diene system monomer; like a cyclopentadiene and cyclohexadiene, etc. are mentioned.

[0019]As an aromatic olefin, styrene, alpha-methylstyrene, divinylbenzene, vinylnaphthalene, vinyltoluene, etc. are mentioned.

[0020]An alicyclic olefin and/or an aromatic olefin are independent, respectively, or can be used combining two or more sorts.

[0021]An alicyclic olefin polymer may be obtained by carrying out copolymerization of said alicyclic olefin and/or an aromatic olefin, and these and a copolymerizable monomer. As an alicyclic olefin or an aromatic olefin, and a copolymerizable monomer, Ethylene, propylene, 1-butene, 1-pentene, 1-hexene, A 3-methyl-1-butene, 3-methyl-1-pentene, 3-ethyl-1-pentene, 4-methyl-1-pentene, a 4-methyl-1-hexene, a 4,4-dimethyl- 1-hexene, 4,4-dimethyl- 1-pentene, a 4-ethyl-1-hexene, a 3-ethyl-1-hexene, 1-octene, 1-decene, 1-dodecen, 1-tetra decene, 1-hexa decene, Nonconjugated diene [, such as ethylene / of the carbon numbers 2-20, such as 1-octadecene and 1-eicosen, / or alpha olefin;1,4-hexadiene, 4-methyl-1,4-hexadiene, 5-methyl-1,4-hexadiene, 1, and 7-octadien,]; etc. are mentioned. These monomers are independent, respectively or can be used combining two or more sorts.

[0022]There is no restriction when the method of the hydrogenation performed [a polymerization method and if needed] for an alicyclic olefin or/and an aromatic olefin is exceptional, and it can carry out in accordance with a publicly known method.

[0023]As an example of an alicyclic olefin polymer, for example The ring-opening-polymerization object and its hydrogenation thing of a norbornene system monomer, The addition polymer of a norbornene system monomer, the addition polymer of a norbornene system monomer and a vinyl compound, a monocycle cycloalkene polymer, an alicyclic conjugated diene polymer, a vinyl system alicyclic hydrocarbon polymer and its hydrogenation thing, the aromatic ring hydrogenation thing of an aromatic olefin polymer, etc. are mentioned. Also in these, the ring-opening-polymerization object and its hydrogenation thing of a norbornene system monomer, The aromatic ring hydrogenation thing of the addition polymer of a norbornene system monomer, the addition polymer of a norbornene system monomer and a vinyl compound, and an aromatic olefin polymer is preferred, and the hydrogenation thing of the ring-opening-polymerization object of a

norbornene system monomer is especially preferred. The aforementioned alicyclic olefin polymer is independent, respectively, or can be used combining two or more sorts.

[0024]The acidic group content compound or acid derivative type residue content compound used for this invention is a compound which has an acidic group or an acid derivative type residue. As an acidic group or an acid derivative type residue, that (henceforth an acid anhydride group) in which the carboxyl group carried out dehydration condensation between a carboxyl group, an ester group, an amide group, intramolecular, or a molecule can be illustrated. That with which the carboxyl group and the amide group coexist especially in the carboxyl group or the amide group is [among these] preferred.

[0025]As an example of a compound of having an acidic group or an acid derivative type residue, Acrylic acid, methacrylic acid, alpha-ethylacrylic acid, maleic acid, boletic acid, Itaconic acid, endo-cis bicyclo[2.2.1]hept 5-ene- 2,3-dicarboxylic acid, Unsaturation carboxylic acid compounds and these ester, or amide, such as methyl-endo-cis bicyclo[2.2.1]hept 5-ene- 2,3-dicarboxylic acid; A maleic anhydride, Unsaturated carboxylic acid anhydrides, such as a chloromaleic anhydride, a butenylsuccinic anhydride, tetrahydro phthalic anhydride, and anhydrous citraconic acid, etc. are mentioned. A maleic anhydride is [among these] preferred.

[0026]The reaction of degeneration with the compound which has an alicyclic olefin polymer, an acidic group, or an acid derivative type residue can be performed by a publicly known method. This reaction of degeneration is performed by making the compound which has an alicyclic olefin polymer, an acidic group, or an acid derivative type residue under existence of a radical initiator usually live together.

[0027]As a radical initiator, benzoyl peroxide, dichlorobenzoyl peroxide, Dicumyl peroxide, di-tert-butylperoxide, 2,5-dimethyl- 2,5-JI (peroxide benzoate) hexyne-3,1,4-bis(tert-butylperoxy isopropyl)benzene, Lauroyl peroxide, tert-butyl pel acetate, 2,5-dimethyl- 2,5-JI (tert-butylperoxy) hexyne-3,2,5-dimethyl- 2,5-JI (tert-butylperoxy) hexane, tert-butyl pel benzoate, tert-butyl bell phenylacetate, tert-butyl pel iso butyrate, tert-butyl ****- sec-octoate, a tert-butyl PERUPIPA rate, a cumyl PERUPIPA rate, tert-butyl pel diethyl acetate, etc. can be mentioned. Furthermore in this invention, an azo compound can also be used as a radical initiator.

Azobisisobutyronitrile and dimethyl azoisobuthylate can be mentioned as a concrete example of an azo compound. Organic peroxide, organic pel ester, etc. are suitably used among these radical initiators.

[0028]These radical initiators are independent, respectively, or can be used combining two or more sorts. a using rate of a radical initiator receives alicyclic olefin polymer 100 weight section -- usually -- it is the range of 0.1 to 30 weight section more preferably 0.01 to 40 weight section 0.001 to 50 weight section.

[0029]Conditions in particular of a reaction of degeneration are not limited, for example, 60-300 ** of reaction temperature is 0-400 ** usually 80-200 ** more preferably, and ranges of reaction time are usually 30 minutes - 10 hours preferably for 1 minute - 24 hours.

[0030]A denaturation rate is carried out to such an extent that a polymer presents alkali solubility. being based on the total number of monomeric units in a polymer in order to present alkali solubility -- usually -- 10-200-mol % -- desirable -- 30-150-mol % -- more -- desirable -- 50-100-mol % -- it is 60-80-mol% of the range especially preferably. When a denaturation rate is in this range, the characteristics, such as a low dielectric, transparency, heat resistance, solvent resistance, development nature, and the surface hardness characteristic, balance

highly, and are preferred.

[0031]A denaturation rate is expressed with a lower type.

denaturation rate (mol %) = $(X/Y) \times 100$ X: -- total number of mols Y: of a denaturation group in a polymer with a compound which has an acidic group or an acid derivative type residue -- the total X monomeric units of a polymer, Since it is the denaturation residue all number of mols in an alkali solubility alicyclic olefin polymer, it can measure by $^1\text{H-NMR}$. Y is equal to a molecular weight of weight-average-molecular-weight (Mw) / monomer of this polymer. In the case of copolymerization, let a molecular weight of a monomer be an average molecular weight of a monomeric mixture.

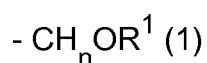
[0032]When an alkali solubility alicyclic olefin polymer used for this invention denatures a compound which has a compound or an ester group which has an acid anhydride group to an alicyclic olefin polymer, It is preferred to hydrolyze or amidate an acid anhydride group or an ester group introduced by a reaction of degeneration.

[0033]As a compound used in order to promote hydrolysis or amidation, potassium hydrate, sodium hydroxide; trimethylamine, triethylamine, and tributylamine; etc. are mentioned. Metal hydroxide is [among these] preferred. In order to hydrolyze or amidate, amine; like water; methylamine, ethylamine, a butylamine, pentylamine, allylamine, diaryl amine, vinyl amine; dimethylamine, and dipropyl amine, etc. are mentioned as a compound to be used. Primary amine and primary amine which has unsaturation carbon-carbon bonding especially are [among these] preferred.

[0034]Although a molecular weight of an alkali solubility alicyclic olefin polymer used for this invention is suitably chosen according to the purpose of use, Toluene, a tetrahydrofuran (THF), or chloroform with weight average molecular weight (Mw) of polystyrene conversion measured with gel permeation chromatography (GPC) used as a solvent. 3,000-500,000 -- desirable -- 5,000-100,000 -- it is the range of 7,000-50,000 more preferably. [usually,] When weight average molecular weight (Mw) of a ring structure containing polymer is in this range, it excels in development nature, surface smoothness, solvent resistance, heat resistance, and especially a strength property, and is suitable.

[0035]Although there is no limitation with an exceptional glass transition temperature of the ring structure containing polymer used for this invention, when it is not less than 100 ** more preferably, it excels in heat resistance and not less than 80 ** of not less than 50 ** is usually preferably preferred.

[0036]The cross linking agent used for this invention is a compound which has a basis expressed with a formula (1).



R^1 in a formula (1) is a hydrogen atom or an alkyl group. the carbon number of an alkyl group -- desirable -- 1-6 -- it is 1-4 more preferably. n -- 1 or 2 -- it is 2 preferably. When n is 1, it becomes a divalent functional group. When the compound which has a basis expressed with a formula (2) is used, it is not limited only to the alkali solubility alicyclic olefin polymer obtained by the reaction of degeneration, but can apply also to the alkali solubility alicyclic olefin polymer obtained by other methods (for example, JP,H11-52574,A).



R¹ is a hydrogen atom or an alkyl group among a formula (2).

[0037]The suitable cross linking agent for this invention has a basis of a formula (1) in [at least two] a molecule. The compound containing the thing which the basis of the formula (1) combined with the nitrogen atom, i.e., N-methylol group, and an N-alkoxy methyl group is preferred. When there are two or more bases of a formula (1) in a monad, R¹ of those bases may be the same, or may differ.

[0038]As an example of this cross linking agent, Like N,N,N',N',N'',N'''-(hexaalkoxy methyl) melamine. alkoxy methylation melamine; -- alkoxy methylation glycoluryl; like N,N',N'',N'''-(tetraalkoxy methyl) glycoluryl -- 1,4-di-(hydroxymethyl) cyclohexane. 1,4-G (hydroxymethyl) norbornane; 1,3,4-trihydroxy cyclohexane etc. are mentioned. N,N,N',N',N'',N'''-(hexamethoxy methyl) melamine or N,N',N'',N'''-(tetraalkoxy methyl) glycoluryl is [among these] preferred.

[0039]It excels in balance of optical cross-linking, heat resistance, and solvent resistance, and alkoxy methylation melamine and alkoxy methylation glycoluryl can also be mixed and used from a point that a hardened material of a lower dielectric constant is obtained. In this case, a weight ratio [alkoxy methylation melamine / alkoxy methylation glycoluryl] -- usually -- 5 / 95 - 95/5 -- it is 10 / 90 - 90/10 preferably.

[0040]Quantity of a cross linking agent is usually ten to 50 weight section to alkali solubility alicyclic olefin polymer 100 weight section, and is ten to 40 weight section especially preferably five to 50 weight section preferably. If there are too few cross linking agents, a pattern in which crosslinking density of an exposure part becomes less enough with which, and is formed as a result will swell, or it will exfoliate, and resolution will be reduced. It may become a thing inferior to the solvent resistance of a hardened material after elevated-temperature bridge construction, and heat resistance-proof. On the contrary, if too large, crosslinking reaction may advance also in an unexposed portion and pattern description formed may get worse.

[0041]The photo-oxide generating agent used for this invention is a substance which induces light and generates Broensted acid or Lewis acid. For example, onium salt, a halogenated organic compound, a quinone diazide compound, It is chosen from an alpha and alpha-bis(sulfonyl)diazomethane compound, an alpha-carbonyl alpha-sulfonyl diazomethane compound, sulfone compounds, an organic acid ester compound, an organic acid amide compound, an organic acid imide compound, etc.

[0042]As an example of onium salt, what has an alkyl group, an alkenyl group, an aralkyl group, an aromatic group, and a heterocycle-like group with diazonium salt, ammonium salt, iodonium salt, sulfonium salt, phosphonium salt, arsonium salt, oxonium salt, etc. is mentioned. The opposite anion in particular of these onium salt is not limited, for example, boron acid, arsenic acid, phosphoric acid, antimononic acid, sulfonic acid, carboxylic acid, or these halogenides are mentioned.

[0043]As an example of a halogenated organic compound, a containing halogen oxadiazole compound, A containing halogen triazine compound, a containing halogen acetophenone compound, A containing halogen benzophenone compound, a containing halogen sulfo KISAIDO compound, Containing halogen sulfone compounds, a containing halogen thiazole compound, a containing halogen oxazol compound, A containing halogen triazole compound, a containing halogen 2-pyrone compound, a containing halogen aliphatic hydrocarbon compound, a containing halogen aromatic hydrocarbon compound, a containing halogen

heterocycle-like compound, a sulfenyl halide compound, etc. can be mentioned.

[0044]As a halogenated organic compound, tris (2, 3-dibromopropyl) phosphate, Tris (2,3-dibromo-3-chloropropyl) phosphate, chloro tetrabromo ethane, Hexachlorobenzene, hexabromobenzene, a hexabromocyclododecane, Hexabromobiphenyl, tribromophenyl allyl ether, tetrachlorobisphenol A, Tetrabromobisphenol A, bis(bromoethyl ether)tetrabromobisphenol A, Bis(chloroethyl ether) tetrachlorobisphenol A, tris (2, 3-dibromopropyl) isocyanurate, 2,2-bis(4-hydroxy-3,5-dibromophenyl)propane, 2,2-bis(4-hydroxyethoxy-3,5-dibromophenyl)propane; Dichlorodiphenyltrichloroethane, Benzene hexachloride, pentachlorophenol, 2,4,6-trichlorophenyl-4-nitrophenyl ether, 2,4-dichlorophenyl 3'-methoxy-4'-nitrophenyl ether, acetic acid, 4,5,6,7-tetrachloro fthalide, 1,1-bis(4-chlorophenyl)ethanol, 1,1-bis(4-chlorophenyl)-2, 2, and 2-trichloroethanol, An ethyl-4,4-dichloro benzoate, a 2,4,5,4'-tetra chlorodiphenyl sulfide, 2,4,5,4'-tetrachloro diphenylsulfone, etc. are mentioned.

[0045]As an example of a quinone diazide compound, 1,2-benzoquinone diazido 4-sulfonic ester, 1,2-naphthoquinonediazide 4-sulfonic ester, 1,2-naphthoquinonediazide 5-sulfonic ester, 1,2-naphthoquinonediazide 6-sulfonic ester, 2,1-naphthoquinonediazide 4-sulfonic ester, Sulfonic ester;1,2-benzoquinone diazido 4-sulfonic acid chloride of a quinone diazide derivative like 2,1-naphthoquinonediazide 5-sulfonic ester and 2,1-naphthoquinonediazide 6-sulfonic ester, 1,2-naphthoquinonediazide 4-sulfonic acid chloride, 1,2-naphthoquinonediazide 5-sulfonic acid chloride, 1,2-naphthoquinonediazide 6-sulfonic acid chloride, 2,1-naphthoquinonediazide 4-sulfonic acid chloride, Sulfonic acid chloride of a quinone diazide derivative like 2,1-naphthoquinonediazide 5-sulfonic acid chloride and 2,1-naphthoquinonediazide 6-sulfonic acid chloride, etc. are mentioned. These photo-oxide generating agents are independent, or can be used combining two or more sorts.

[0046]The quantity of a photo-oxide generating agent is usually 0.5 to 20 weight section to alkali solubility alicyclic olefin polymer 100 weight section, and is one to 10 weight section especially preferably one to 15 weight section preferably. If there are too few photo-oxide generating agents, the pattern which it may become insufficient constructing a bridge according to an optical exposure, and is formed as a result may swell dissolve, or may exfoliate. On the contrary, when too large, there is a case where crosslinking reaction advances, and an unexposed part does not dissolve as a result, but it becomes impossible for a radiation sheep irradiation part to also develop a pattern.

[0047]The photosensitive composition of this invention can be made to contain a surface-active agent furthermore for the purpose of prevention of striae SHON (after spreading ****), and Hitoshi Kougami of development nature. As a surface-active agent, for example Polyoxyethylene lauryl ether, Polyoxyethylene alkyl ether, such as polyoxyethylene stearyl ether and polyoxyethylene oleyl ether; Polyoxyethylene octylphenyl ether, Polyoxyethylene aryl ether, such as polyoxyethylene nonylphenyl ether; Polyoxyethylene dilaurate, Nonion system surface-active agent; EFUTOPPEF301, such as polyoxyethylene dialkyl ester, such as polyoxyethylene distearate, -- said -- 303 -- said -- 352 (made in new Akita Chemicals). The megger fuck F171, said F172, said F173 (made by Dainippon Ink & Chemicals, Inc.), Fluorad FC-430, the FC-431 (made by Sumitomo 3M), Fluorochemical surfactants, such as Asahi guard AG710, the Sir chlorofluocarbon S-382, the

SC-101, the SC-102, the SC-103, the SC-104, the SC-105, and the SC-106 (made by Asahi Glass Co., Ltd.); Organosiloxane polymer KP341. (Shin-Etsu Chemical Co., Ltd. make) poly flow No. 57, said -- acrylic acid copolymer (meta-) system surface-active agents, such as 95 (product made from Kyoeisha Fatty chemistry Industry), are mentioned. Below as for the amount part of duplexs, the above-mentioned surface-active agent is preferably used to solid content 100 weight section of a photosensitive composition if needed in the quantity of one or less weight section.

[0048]The photosensitive composition of this invention can also blend a heat acid generator in order to improve heat resistance and chemical resistance. A heat acid generator used by this invention is a substance which generates acid with heating. For example, sulfonium salt, benzo thiazolium salt, ammonium salt, and onium salt like phosphonium salt are mentioned. Also in these, sulfonium salt and benzo thiazolium salt are preferred.

[0049]As an example of sulfonium salt, 4-aceto phenyldimethyl sulfoniumhexafluoroantimonate, 4-acetoxypheyl dimethyl sulfonium Hexafluoroarsenate, Dimethyl- 4-(benzyloxy carbonyloxy) phenyl sulfonium Hexafluoroantimonate, Dimethyl- 4-(benzoyloxy) phenyl sulfonium Hexafluoroantimonate, Dimethyl- 4-(benzoyloxy) phenyl sulfonium Hexafluoroarsenate, Alkyl sulfonium salt, such as dimethyl- 3-chloro-4-acetoxypheyl sulfoniumhexafluoroantimonate; benzyl-4-hydroxy phenylmethyl sulfonium Hexafluoroantimonate, Benzyl-4-hydroxy phenylmethyl sulfonium Hexafluorophosphate, 4-acetoxypheyl benzylmethyl sulfonium Hexafluoroantimonate, Benzyl-4-methoxy phenylmethyl sulfonium Hexafluoroantimonate, benzyl-2-methyl-4-hydroxy phenylmethyl sulfonium Hexafluoroantimonate, Benzyl-3-chloro-4-hydroxy phenylmethyl sulfonium Hexafluoroarsenate, 4-methoxybenzyl 4-hydroxy phenylmethyl sulfonium Benzylsulfonium salt, such as hexafluorophosphate;

[0050]Dibenzyl-4-hydroxyphenyl sulfonium Hexafluoroantimonate, Dibenzyl-4-hydroxyphenyl sulfonium Hexafluorophosphate, 4-acetoxypheyl dibenzyl sulfonium Hexafluoroantimonate, Dibenzyl-4-methoxyphenyl sulfonium Hexafluoroantimonate, Dibenzyl-3-chloro-4-hydroxyphenyl sulfonium Hexafluoroarsenate, Dibenzyl-3-methyl-4-hydroxy-5-tert-buthylphenyl sulfonium Hexafluoroantimonate, Dibenzylsulfonium salt, such as benzyl-4-methoxybenzyl 4-hydroxyphenyl sulfonium hexafluorophosphate; p-chlorobenzyl-4-hydroxy phenylmethyl sulfonium Hexafluoroantimonate, p-nitrobenzyl 4-hydroxy phenylmethyl sulfonium Hexafluoroantimonate, p-chlorobenzyl-4-hydroxy phenylmethyl sulfonium Hexafluorophosphate, p-nitrobenzyl 3-methyl-4-hydroxy phenylmethyl sulfonium Hexafluoroantimonate, 3,5-dichlorobenzyl-4-hydroxy phenylmethyl sulfonium Hexafluoroantimonate, o-chlorobenzyl-3-chloro-4-hydroxy phenylmethyl sulfonium Substitution benzylsulfonium salt;, such as hexafluoroantimonate, is mentioned.

[0051]As an example of a benzothia ZONIUMU salt, 3-benzylbenzo thiazolium hexafluoroantimonate, 3-benzylbenzo thiazolium Hexafluorophosphate, 3-benzylbenzo thiazolium Tetrafluoroborate, 3-(p-methoxybenzyl) benzo thiazolium Hexafluoroantimonate, 3-benzyl-2-methylthio benzo thiazolium hexafluoroantimonate, a 3-benzyl-5-chlorobenzo thiazolium Benzylbenzo thiazolium salt, such as hexafluoroantimonate, is mentioned.

[0052]It is 4-acetoxypheyl dimethyl sulfonium among these. Hexafluoroarsenate, Benzyl-4-hydroxy

phenylmethyl sulfonium Hexafluoroantimonate, 4-acetoxyphenyl benzylmethyl sulfonium Hexafluoroantimonate, Dibenzyl-4-hydroxyphenyl sulfonium Hexafluoroantimonate, 4-acetoxyphenyl benzyl sulfonium Hexafluoroantimonate, 3-benzylbenzo thiazolium hexafluoroantimonate, etc. are used preferably. these heat acid generators are independent -- it is -- two or more sorts can be combined and it can use.

[0053]An adhesion auxiliary agent may be included in a photosensitive composition of this invention in order to raise adhesion with a substrate. A functionality silane coupling agent etc. are mentioned as such an adhesion auxiliary agent. As an example of this functionality silane coupling agent, Trimethoxysilyl benzoic acid, gamma-methacryloxypropyl trimethoxy silane, Vinyltriacetoxysilane, vinyltrimetoxysilane, gamma-isocyanatepropyl triethoxysilane, gamma-glycidoxypropyltrimetoxysilane, beta-(3, 4-epoxycyclohexyl) ethyltrimethoxysilane, etc. are mentioned. quantity of this adhesion auxiliary agent receives alkali solubility alicyclic olefin polymer 100 weight section -- usually -- 20 or less weight sections are one to 10 weight sections especially preferably 0.05 to 10 weight section preferably.

[0054]Furthermore, a sensitizer, a spray for preventing static electricity, preservation stabilizer, a defoaming agent, paints, a color, etc. may be included in a photosensitive composition of this invention if needed.

[0055]As a sensitizer, benzophenone, anthraquinone, 1,2-naphthoquinone, 1,4-naphthoquinone, benzanthrone, p,p'-tetramethyldiaminobenzophenone, A carbonyl compound like chloranil; Nitrobenzene, p-dinitrobenzene, A nitro compound like 2-nitrofluorene; Anthracene, a sulfur-compounds; nitroaniline like aromatic hydrocarbon; diphenyldisulfide like a chrysene, A 2-chloro-4-nitroaniline, 5-nitro 2-toluidine, and a nitrogen compound like tetracyanoethylene are mentioned.

[0056]As preservation stabilizer, hydroquinone, methoxy phenol, and p-t-butylcatechol, The hydroxy aromatic compound like 2,6-di-t-butyl-p-cresol; Benzoquinone, quinone compound; like p-torr quinone -- amine compound; like phenyl-alpha-naphthylamine -- sulfur compound; like 4,4'-Thiobis (6-t-butyl-3-methyl phenol) and 2,2'-Thiobis (4-methyl-6-t-butylphenol) is mentioned.

[0057]By mixing each of above-mentioned ingredients uniformly, it can prepare easily, it usually dissolves in a suitable solvent, and the photosensitive composition of this invention is used by solution states. As this solvent, for example Methanol, ethanol, propanol, Alcohols, such as butanol; Cyclic ether; methyl-cellosolve acetate, such as a tetrahydrofuran and dioxane, Cellosolve ester species, such as ethylcellosolve acetate; Ethylene glycol monomethyl ether, Ethylene glycol monoethyl ether, diethylene glycol monomethyl ether, Diethylene glycol monoethyl ether, diethylene glycol dimethyl ether, Glycol ether, such as propylene glycol monomethyl ether; propylene glycol alkyl ether acetate, such as propylene-glycol-methyl-ether acetate and propylene glycol propyl ether acetate;

[0058]Aromatic hydrocarbon, such as benzene, toluene, and xylene; Methyl ethyl ketone, Ketone; 2-ethyl hydroxypropionate, such as cyclohexanone, 2-heptanone, and 4-hydroxy-4-methyl-2-pentanone, 2-hydroxy-2-methylpropionic acid ethyl, 2-hydroxy-2-methylpropionic acid ethyl, 2-hydroxy-ethoxyethyl acetate, hydroxyethyl acetate, and methyl 3-methylbutanoate, Ester species, such as 3-methoxy methyl propionate, 3-methoxy ethyl propionate, 3-ethoxyethyl propionate, 3-ethoxymethyl propionate, ethyl acetate, butyl acetate, and ethyl lactate;

[0059]Aprotic polar solvents, such as dimethylformamide and N-methyl-2-pyrrolidone, are mentioned. N-methylformamide, N,N-dimethylformamide, N-methylformanilide, N-methylacetamide, N,N-dimethylacetamide, N-methyl pyrrolidone, Dimethyl sulfoxide, benzyl ethyl ether, dihexyl ether, Acetylacetone, isophorone, caproic acid, caprylic acid, 1-octanol, Solvents, such as 1-nonanol, benzyl alcohol, benzyl acetate, ethyl benzoate, a diethyl oxalate, a diethyl maleate, gamma-butyrolactone, ethylene carbonate, propylene carbonate, and a phenyl cellosolve acetate, can also be used. Ketone, glycol ether, or amide are preferably used from the ease of carrying out of formation of solubility and a coat among these solvents.

[0060]Although a photosensitive composition in particular of this invention is not limited by solids concentration, it is usually 5 to 40 weight %. It is preferred to present use, after filtering a photosensitive composition solution prepared as mentioned above using a filter etc.

[0061]The photosensitive composition of this invention can form a coat by being applied to a substrate face as a solution and receiving removal of a solvent with heating. As a coating method of a photosensitive composition solution to a substrate face, various kinds of methods, such as a spray method, the roll coat method, and a spin coating method, are employable, for example. Subsequently, this coat is heated (Pre-Bake). By heating, a solvent volatilizes and an illiquid coat is obtained. Although heating conditions change with a kind of each ingredient, blending ratios, etc., they are usually a for [10 to 600 seconds] grade at 60-120 **.

[0062]Next, after irradiating a heated coat via a mask of a prescribed pattern, it heats if needed (Post Exposure Bake), negatives are developed with a developing solution, and an unnecessary portion is removed. By performing Post Exposure Bake, the reproducibility of a pattern may become good.

[0063]After irradiating with light, a pattern is developed using a developing solution. As a developing solution, for example Sodium hydroxide, a potassium hydrate, sodium carbonate, Inorganic alkali, such as a sodium silicate, metasilicic acid sodium, and an ammonia solution; Ethylamine, Primary amine, such as n-propylamine; Secondary-amines; triethylamines, such as diethylamine and di-n-propylamine, Tertiary amines, such as methyl diethylamine and N-methyl pyrrolidone; Dimethylethanolamine, Alcohol amines, such as triethanolamine; Tetramethylammonium hydroxide, Tetraethylammoniumhydroxide, tetrabutylammonium hydroxide, Quarternary ammonium salt, such as Kolin; an alkaline aqueous solution which consists of alkali of cyclic amines, such as pyrrole, piperidine, 1,8-diazabicyclo [5.4.0]-7-undecene, and 1,5-diazabicyclo [4.3.0]-5-nonane, can be used. Solution which carried out adequate amount addition of water soluble organic solvents, such as methanol and ethanol, the surface-active agent, etc. can also be used for the above-mentioned alkaline aqueous solution as a developing solution.

[0064]Developing time is usually for 30 to 180 seconds. Any, such as a paddle method, a liquid peak method, and a dipping method, may be sufficient as a developing method. By performing stream washing after development and making it dry with compressed air or compressed nitrogen, the moisture on a substrate is removed and a pattern state film is formed. This pattern state film is completely irradiated with the beam of light by a high-pressure mercury-vapor lamp etc. after that. Then, with heating apparatus, such as a hot plate and oven, with prescribed temperature, for example, 150-250 **, if it is on predetermined time, for example, a hot

plate, in 5 to 30 minutes, and in oven, a pattern state bridge construction film can be obtained by carrying out heat-treatment for 30 to 90 minutes. As for heat-treatment, it is specifically preferred among hypoxia atmosphere to carry out in atmosphere with an oxygen density of 10 ppm or less. Heat-treatment in this hypoxia atmosphere is applicable not only to the photosensitive resin composition of this invention but the photosensitive resin composition containing other alkali solubility alicyclic olefin polymers.

[0065]The thing which makes it come to harden the photosensitive composition of this invention, As an insulating material, it is used suitably for the insulating layer of the interlayer insulation film; liquid crystal display of overcoat material; multilayered circuit boards, such as an electronic device like a semiconductor device, a light emitting diode, and various memories,; hybrid IC, MCM, a printed-circuit board, electronic parts, etc., for example.

[0066]

[Working example]An embodiment and a comparative example are given to below, and this invention is concretely explained to it. Among an embodiment, a "part" is a "weight section", as long as there is no notice especially.

A hydrolysis rate of a denaturation thing of an alicyclic olefin polymer after <examination and valuation method> (1) hydrolysis rate hydrolysis was measured by FT-IR. A hydrolysis rate of an alicyclic olefin polymer which has an ester group was measured by $^1\text{H-NMR}$.

(2) Molecular weight weight average molecular weight (Mw) was measured as a polystyrene reduced property by a gel permeation chromatography (GPC) which uses a tetrahydrofuran as a solvent.

(3) A hydrogenation rate of a denaturation rate alicyclic olefin polymer main chain and a graft denaturation rate of an alicyclic olefin polymer were measured by $^1\text{H-NMR}$.

(4) According to dielectric constant JIS C6481, a dielectric constant (epsilon) in 1 MHz (room temperature) was measured.

[0067](5) A silicon substrate in which a heat-resistant dimensional stability pattern state thin film was formed was heated for 60 minutes using 220 ** oven, and a rate of thickness after heating to thickness before heating made [not less than 95% of case] x ** and less than 90% of case for O and not less than 90% of less than 95% of case.

(6) A solution of a photosensitive resin composition was applied on a silicon oxidation film base which has a level difference of 1.0 micrometer of surface smoothness, and, subsequently this substrate was heated for 30 minutes at 200 ** on a hot plate. The maximum level difference (d) of this thin film was measured using a film thickness gage of a contact process, and a case of O and $5\% \leq d$ was evaluated for a case of $5\% > d$ as x.

(7) The glass substrate with a coat was obtained like the above except having used the transparent glass board "Corning 7059" (made by Corning). Subsequently, the minimum light transmission (t) in the wavelength of 400-800 nm was measured for the transmissivity of the obtained glass substrate using the Jasco Corp. make ultraviolet visible near-infrared spectrophotometer (V-570), and the case of ** and $93\% > t$ was evaluated [the case of $95\% \leq t$] for O and $\leq [93\% \text{ of }] t < 95\% \text{ of case as x}$.

(8) After heating the glass substrate with a coat of the thermochromism above for 60 minutes in 220 ** oven,

the transmissivity of this glass substrate was measured like the above (7), the rate of change (T) before and behind heating was computed, and the case of ** and $10\% \leq T$ was evaluated [the case of $5\% > T$] for O and $\leq [5\% \text{ of }] T < 10\%$ of case as x.

[0068](9) The glass substrate in which the solvent resistance pattern state thin film was formed was immersed for 15 minutes into 70 ** dimethyl sulfoxide, the rate of a thickness change (S) was measured, and the case of ** and $10\% \geq S$ was evaluated [the case of $5\% > S$] for O and $\leq [5\% \text{ of }] S < 10\%$ of case as x.

(10) A pattern state thin film with a thickness of 3.0 micrometers formed on the resolution glass substrate is observed with a scanning electron microscope, The minimum pattern dimension (W) in which the line and space is formed with the line width of 1:1 evaluated O and the case of $5 \text{ micrometer} < W \leq 10 \text{ micrometer}$ for the case of 5 micrometers or less, and evaluated ** and the case of $W > 15 \text{ micrometers}$ for O and the case of $10 \text{ micrometer} < W \leq 15 \text{ micrometer}$ as x.

(11) It observed with the scanning electron microscope about the minimum pattern dimension expressed as development nature resolution, and the case where there were O and they about the case where there is neither SCUM nor the development remainder was evaluated as x.

[0069][Embodiment 1] 1-hexene is used as the polymerization catalyst which consists of tungsten hexachloride, triisobutylaluminum, and isobutyl alcohol, and a regulator, Ring opening polymerization of 4.4.12 and the 8-ethyltetracyclo [5.17-10.0]-3-dodecen (it abbreviates to ETD hereafter.) was carried out by the publicly known method. The acquired ring-opening-polymerization object was respectively hydrogenated using the catalysts for hydrogenation of nickel acetylacetonato and triisobutylaluminum, and the hydrogenation rate obtained not less than 99% of ring-opening-polymerization object hydrogenation thing. Subsequently, 100 copies of ring-opening-polymerization object hydrogenation things, 200 copies of maleic anhydrides, and 400 copies of t-butylbenzenes and 500 copies of anisoles were mixed in autoclave, and temperature up was carried out to 135 **. After dividing 20 copies of JIKUMIRU peroxide into ten and carrying out consecutive addition to this reaction vessel at intervals of 12 minutes, it was made to react for further 3 hours. It added and the water of 400 copies was made to react into a reaction vessel furthermore for 10 hours. Reaction mixture was dropped into a lot of isopropanol, and it solidified, and dried, and denaturation polymer was obtained. The physical properties of denaturation polymer are shown in Table 1.

[0070]To 100 copies of denaturation polymer, 20 copies of cross linking agents (N,N,N',N',N'',N''-(hexamethoxy methyl) melamine: CYMEL300 Mitsui psytec company make), Five copies of acid generators (2-piperonyl bis (4,6-trichloromethyl)-S-triazine: made by the Midori chemistry company) and 0.05 copy of surface-active agent (made by megger fuck F172 Dainippon Ink & Chemicals, Inc.) were dissolved in cyclohexanone so that the amount of mixtures might be 20 weight %. A prepared solution was filtered with a 0.45-micrometer Millipore filter, after carrying out a spin coat to each on a silicon substrate, a glass substrate, and a silicon oxidation film base that has a level difference of 1 micrometer, it prebaked on a hot plate for 2 minutes at 90 **, and a coat of 3.0 micrometers of thickness was formed. A mask which has a predetermined pattern was placed on a silicon substrate with an obtained coat, and it irradiated with ultraviolet rays of wavelength of 365 nm, and light intensity 5 mW/cm^2 so that it might become an amount of energy of 50 mJ/cm^2 in the air. Post Exposure Bake

processing was performed for 2 minutes on a 110 °C hot plate after an exposure. Subsequently, a development for [25 °C] 60 seconds was performed using 0.3wt% of tetramethylammonium solution. Then, ultrapure water performed rinsing treatment for 1 minute. In this way, a thin film which has a pattern of a negative mold was formed. By heating a glass substrate with a coat which has not carried out a silicon substrate in which this pattern was formed, and a development for 30 minutes at 200 °C on a hot plate, Postbake of a pattern and a coat was performed and a silicon substrate in which a pattern state thin film was formed, a glass substrate with a coat, and a silicon oxidation film base that has a level difference of 1 micrometer with a coat were obtained. Using various kinds of obtained substrates, a dielectric constant, transparency, thermochromism, surface smoothness, heat-resistant dimensional stability, solvent resistance, resolution, and development nature were evaluated, and a result was shown in Table 2.

[0071]

[Table 1]

表 1

	変性率 [モル%]	重量平均分子量	加水分解率 [%]
実施例 1	8.2	1.2×10^4	約 100
実施例 2	6.1	1.2×10^4	約 100
実施例 3	4.4	1.2×10^4	約 100
実施例 4	6.5	3.8×10^4	約 100
実施例 5	6.2	5.6×10^4	約 100
実施例 6	4.5	5.6×10^4	約 100
実施例 7	5.9	3.3×10^4	約 100
実施例 8	6.1	1.2×10^4	約 100
比較例 1	—	1.6×10^4	96
比較例 2	—	1.3×10^4	95

[0072][Embodiment 2] Denaturation polymer was obtained like Embodiment 1 except having changed the quantity of 150 copies and JIKUMIRU peroxide into 15 copies for the quantity of the maleic anhydride. The silicon oxidation film base etc. were obtained like Embodiment 1 using this denaturation polymer. The evaluation result is shown in Table 1 and 2.

[0073][Embodiment 3] Denaturation polymer was obtained like Embodiment 1 except having changed the quantity of 80 copies and JIKUMIRU peroxide into eight copies for the quantity of the maleic anhydride. The silicon oxidation film base etc. were obtained like Embodiment 1 using this denaturation polymer. The evaluation result is shown in Table 1 and 2.

[0074][Embodiment 4] Denaturation polymer was obtained like Embodiment 1 except having changed into 1/10 the quantity of 1-hexene used at the time of ring opening polymerization. The silicon oxidation film base etc. were obtained like Embodiment 1 using this denaturation polymer. The evaluation result is shown in Table 1 and 2.

[0075][Embodiment 5] Denaturation polymer was obtained like Embodiment 1 except having changed into 1/20 the quantity of 1-hexene used at the time of ring opening polymerization. The silicon oxidation film base etc.

were obtained like Embodiment 1 using this denaturation polymer. The evaluation result is shown in Table 1 and 2.

[0076][Embodiment 6] Denaturation polymer was obtained like Embodiment 1 except having changed the quantity of 80 copies and JIKUMIRU peroxide into eight copies for the quantity of the maleic anhydride. The silicon oxidation film base etc. were obtained like Embodiment 1 using this denaturation polymer. The evaluation result is shown in Table 1 and 2.

[0077][Embodiment 7] About ETD used at the time of ring opening polymerization, they are ETD/tricyclo.

[4.3.0.1^{2, 5}] Denaturation polymer was obtained like Embodiment 1 except having changed into deca- 3,7-diene <weight ratios 80/20>. The silicon oxidation film base etc. were obtained like Embodiment 1 using this denaturation polymer. The evaluation result is shown in Table 1 and 2.

[0078][Embodiment 8] Denaturation polymer was obtained like Embodiment 2 except having changed the water of 400 copies into the allylamine of 400 copies. The silicon oxidation film base etc. were obtained like Embodiment 1 using this denaturation polymer. The evaluation result is shown in Table 1 and 2.

[0079][Comparative example 1] Ring opening polymerization of the 8-methyl 8-carbomethoxy tetracyclo [4.4.0.1^{2, 5}.1^{7, 10}]-3-dodecen was carried out, and weight average molecular weight acquired 16 and the ring-opening-polymerization object of 000. Subsequently, this ring-opening-polymerization object was hydrogenated, it hydrolyzed and the hydrolytic polymerization object of 96% of the hydrolysis rate was acquired. The silicon oxidation film base etc. were obtained like Embodiment 1 using the hydrolytic polymerization object. The evaluation result is shown in Table 1 and 2.

[0080][Comparative example 2] except having used the mixture (80 / 20 mole ratios) of 8-methyl 8-carbomethoxy tetracyclo [4.4.0.1^{2, 5}.1^{7, 10}]-3-dodecen and bicyclo[2.2.1]hept 2-ene (it omits the following NB) as a monomer, The hydrolytic polymerization object whose hydrolysis rate the weight average molecular weight of a ring-opening-polymerization object is 13,000, and is 95% was acquired like the comparative example 1. The silicon oxidation film base etc. were obtained like Embodiment 1 using the hydrolytic polymerization object. The evaluation result is shown in Table 1 and 2.

[0081]

[Table 2]

表 2

	誘電率 ϵ	耐熱 寸法 安定 性	平坦 性	耐熱 変色	透明 性	耐溶 剤性	解像 度	現像 性
実施例 1	2. 7 2	○	○	○	○	○	◎	○
実施例 2	2. 6 2	○	○	○	○	○	◎	○
実施例 3	2. 6 2	○	○	○	○	○	○	○
実施例 4	2. 6 6	○	○	○	○	○	◎	○
実施例 5	2. 6 5	○	○	○	○	○	○	○
実施例 6	2. 6 1	○	○	○	○	○	△	○
実施例 7	2. 6 4	○	○	○	○	○	◎	○
実施例 8	2. 4 8	○	○	○	○	○	◎	○
比較例 1	2. 7 6	○	○	○	△	△	×	×
比較例 2	2. 7 3	○	○	○	△	△	×	×

[0082] Table 2 shows that this invention (embodiments 1-8) is excellent also in which characteristic of low dielectric property, heat-resistant dimensional stability, surface smoothness, thermochromism, transparency, solvent resistance, resolution, and development nature. In the case (embodiment 8) where the polymer produced by disassembling a maleic anhydride group by the 1st class amine especially is used, it turns out that a dielectric constant becomes very low. If the denaturation polymer whose weight average molecular weight is 40,000 or less and whose denaturation rate is 60-mol % - 80-mol % is used (embodiments 1, 2, 4, and 7), Compared with denaturation polymer whose denaturation rate is comparatively low, or denaturation polymer (embodiments 3 and 5) whose weight average molecular weight is comparatively high, it turns out that resolution is excellent. It turns out that what has as low a molecular weight of a denaturation polymer as [about] 10,000 is excellent in resolution as compared with what has a high molecular weight (comparison of Embodiment 3, Embodiment 6 and Embodiment 4, and Embodiment 5). On the other hand, when a hydrolytic polymerization object is used (comparative examples 1-2), each is excellent in low dielectric property, heat-resistant dimensional stability, surface smoothness, thermochromism, transparency, and solvent resistance, but it turns out that it is inferior to resolution and development nature.

[0083]

[Effect of the Invention] The photosensitive composition of this invention can form easily the detailed pattern state thin film excellent in the low dielectric while it is excellent in many performances, such as surface smoothness, heat resistance, transparency, and chemical resistance, by carrying out spreading desiccation on a silicon substrate etc., carrying out pattern exposure and developing negatives after that. The thin film obtained with the photosensitive composition of this invention, As an insulating material, it is used suitably for the insulating layer of the interlayer insulation film; liquid crystal display of overcoat material; multilayered circuit boards, such as an electronic device like a semiconductor device, a light emitting diode, and various memories,; hybrid IC, MCM, a printed-circuit board, electronic parts, etc., for example.

[Translation done.]